

range with the head end 500. The wireless broadband router 625 and the computer 692 are shown to show that the sector probe 695 can be placed with an existing user in the customer premises 600 with no negative effects on the user.

5 FIG. 9 is a flow chart for the sector probe 695 in an example of the invention. FIG. 9 begins in step 900. In step 902, the sector probe 695 receives an instruction to execute a plurality of tests. In step 904, the sector probe 695 then executes the plurality of the tests to measure the performance of the broadband wireless system 100. The sector probe 695 determines performance
10 information from the results of the plurality of the tests in step 906. In step 908, the sector probe 695 stores the performance information in the memory 830. Any reporting system in the performance management system 700 can then retrieve the performance information. FIG. 9 ends in step 910.

15 FIGS. 10-13 disclose one embodiment of the invention, but the invention is not restricted to the configuration provided below. Those skilled in the art will appreciate numerous variations in a sector probe configuration and operation that are within the scope of the invention. Those skilled in the art will also appreciate how the principles illustrated in this example can be used in other examples of the invention. In this embodiment, the sector probe 695 measures
20 the performance of the broadband wireless system 100 by simulating web surfing of the top ten websites, transferring files using File Transfer Protocol (FTP), and using a ping test to measure delay. Typically, there is one sector probe per sector, and a head end typically controls eight to ten sectors. With two head ends per market, there are between sixteen to twenty sector probes per market.

25 FIG. 10 is a flow chart for the sector probe 695 with web surfing, FTP, and delay tests in an example of the invention. FIG. 10 begins in step 1000. The sector probe 695 receives and processes an instruction to execute a plurality of tests. In step 1002, the sector probe 695 executes a WGET program for web surfing. Step 1002 and the WGET program are discussed below in greater detail
30 in FIG. 11. In step 1004, the sector probe 695 executes a bulk file transfer script. Step 1004 and the bulk file transfer script are discussed below in greater detail in

FIG. 12. In step 1006, the sector probe 695 executes a ping test to measure delay. Step 1006 and the ping test are discussed below in greater detail in FIG. 13.

In step 1008, the sector probe 695 executes a raw channel capacity test. In this embodiment, the raw channel capacity test is a New Test TCP (NTTCP) program to simulate bit-error-rate testing over the wireless links 128 and 129. The NTTCP program is an open source software package that transmits a flood of unacknowledged packets over a link and measures the number of received packets versus the number of dropped or corrupted packets. The NTTCP program assists in determining the general condition of the wireless links 128 and 129.

In step 1010, the sector probe 695 executes an out of lock indicator test. The out of lock indicator test indicates the presence of a clean Quadrature Amplitude Modulation (QAM) signal. If the modem, within the wireless broadband router 690, goes out of lock, then there is an RF interference in the air or a bad component in a piece of the equipment. In step 1012, the sector probe 695 executes a downstream FEC test. The FEC test detects FEC errors that indicate dropped packets. In step 1014, the sector probe 695 stores the results of the tests of steps 1002-1012 in the memory 830. FIG. 10 ends in step 1016.

FIG. 11 is a flow chart for the sector probe 695 for a web surfing test in an example of the invention. FIG. 11 begins in step 1100. In step 1102, the sector probe 695 measures the start time of the WGET program. The WGET program is an open-source program used to transfer a single file over a HyperText Transfer Protocol (HTTP) connection from a server. In this embodiment, the sector probe 695 executes the WGET program for ten popular websites such as Yahoo, ESPN, and MSN. In step 1104, the sector probe 695 transmits a request for the ten popular web pages. In step 1106, the sector probe 695 receives the ten popular web pages. In step 1108, the sector probe 695 measures total network performance including delay, download speed, dropped packets, TCP slow start, and acknowledgements. One example of web throughput is shown in

FIG. 45, which is discussed below. The sector probe 695 then measures the end time of the WGET program in step 1110. FIG. 11 ends in step 1112.

FIG. 12 is a flow chart for the sector probe 695 for a bulk file transfer script in an example of the invention. FIG. 12 begins in step 1200. In step 1202, the sector probe 695 measures the start time of the bulk file transfer script. The bulk file transfer script measures performance during transfer of bulk files. In step 1204, the sector probe 695 sets up an FTP session with a file server. In this embodiment, the sector probe 695 sets up the FTP session with the market performance management system 430. In step 1206, the sector probe 695 generates and transmits an instruction to get files from the file server. In this embodiment, a large file of 4 MB is retrieved. One example of downstream data throughput is shown in FIG. 45, which is discussed below. In step 1208, the sector probe 695 generates and transmits an instruction to put files on the file server. One example of upstream data throughput is shown in FIG. 45, which is discussed below. In step 1210, the sector probe 695 then measures the end time of the bulk file transfer script. FIG. 12 ends in step 1212.

FIG. 13 depicts a flow chart for the sector probe 695 for a ping test in an example of the invention. FIG. 13 begins in step 1300. The ping test is a standard TCP/IP utility to measure the round trip time between two hosts. The ping test also can measure the time between two endpoints on a link and the average delay of packets on that link. This ping test transmits eleven pings at one-second intervals. In step 1302, the sector probe 695 measures the start time of the ping test. In step 1304, the sector probe 695 transmits and receives one ping. In step 1306, the sector probe 695 measures the delay of the one ping to measure the time to acquire a spot in a polling channel. This delay indicates the speed at which a transmission begins. A first ping is measured separately because the time to acquire a spot in the polling channel will be longer than future credit reception cycles. One example of delay for one ping is shown in FIG. 46, which is discussed below.

In step 1308, the sector probe 695 transmits and receives ten pings. In step 1310, the sector probe 695 measures the delays of the ten pings. The